PLANTERS' BULLETIN

OF THE RUBBER RESEARCH INSTITUTE OF MALAYA

NEW SERIES NUMBER SIX

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Price
50 Cents

RUBBER RESEARCH INSTITUTE OF MALAYA
INCORPORATED 1925

May
1953

RRI

LOCATION The Institute's Laboratories and Offices are at the third mile, Ampang Road, Kuala Lumpur.

CORRESPONDENCE All *letters* must be addressed to the Director, Rubber Research Institute of Malaya, Post Office Box 150, Kuala Lumpur. Special inquiries may be marked for the attention of a particular officer, if so desired (See Staff List in Bulletin No. 1, page 24). The address for *telegrams* is Searching, Kuala Lumpur. *Telephone:* Kuala Lumpur 3351/2/3. *Parcels* occasionally arrive without any indication of their origin. It is requested that senders will write their names and addresses clearly on the outside of all packages, and also advise the Institute by letter or telegram of their despatch. This is especially important for perishables, such as latex samples and plant specimens.

PROHIBITED PLANT SPECIMENS Attention of planters and others in territories outside the Federation of Malaya and the Colony of Singapore is drawn to the Malayan Plant Importation Rules which prohibit the importation into Malaya of any part of a plant, whether living or dead, unless it is accompanied by a permit issued by the Director of Agriculture, Federation of Malaya. No permit will be issued in respect of any diseased plant or any plant pest. Any plant imported in contravention of these Rules (whose object is to prevent the introduction of diseases or pests) will be destroyed without examination. Anyone outside Malaya who desires our advice on pests or diseases or any other matters that may require examination of living material must first submit an inquiry by letter giving the fullest possible description of their problem.

ADVICE Inquiries are invited from rubber producers in the Federation of Malaya, the Colonies of Singapore and North Borneo, and the territories of Sarawak, Brunei and Nigeria, who may require more detailed information applicable to their own special problems. *Interviews* should be arranged by letter or telephone, as members of the senior research and advisory staff are frequently absent on visits to plantations. The Institute is open from 8 AM to 1 PM and 2 PM to 4 PM on Mondays to Fridays, and from 8 AM to 12.30 PM on Saturdays.

EXPERIMENT STATION AND FACTORY This station of the RRI is situated 16 miles from Kuala Lumpur, at Sungei Buloh on the Kuala Lumpur — Kepong — Kuala Selangor road. Visits may be made on Mondays or Wednesdays by arrangement with the Director of the Rubber Research Institute (see *Correspondence* above). There is a guest house

PLANTERS' BULLETIN

OF THE RUBBER RESEARCH INSTITUTE OF MALAYA

Kuala Lumpur May 1953 New Series No. 6

Editorial

Planters' Bulletin resumed publication a year ago, with a New Series. Since then it has shaken down in style and policy, and now appears regularly on the first of each alternate month. Its purpose was fully described in the first issue, its main object is service to planters, particularly in providing readily accessible advisory information.

The R.R.I., after the period of postwar reconstruction, has now passed the halfway mark in its first five years' programme of expansion of research on the planter's problems, and a valuable fund of knowledge and experience is being built up. It is not our purpose here to give detailed reports of research but to go one step further and to present information and advice of direct use to the planter. This function is a part of the vitally important link between the laboratory and the plantation. Each article in the body of the journal is written with this object in view, that it shall be of direct practical significance in estate practice. Sometimes wider topics of background interest will also be discussed, under the *Editorial* heading.

Since 1946 a new generation of young planters has entered the industry and into their hands the working of the estates will pass. Unhappily, the published texts and information now available do little to meet their need for practical knowledge based on sound principles. With Edgar's *Manual of Rubber Planting (Malaya)* out of print, the new edition is eagerly awaited and will do much to fill the gap. For the time being we are doing what we can in this direction. There is still a continuous demand for back issues of the old series of *Planters' Bulletin.* Thus No. 2, which was published in March 1939, has been long out of print but is still sought for its articles on clones and seedling families. It is intended to revise these articles for publication in the near future.

A journal of this kind must be a living thing if it is to accomplish its purpose. *Planters' Bulletin* exists for its readers. Your constructive criticism will help us to do a better job.

Articles are also invited from our readers. In this issue we welcome two 'guest' articles, *Rhinoceros Beetle: A Warning* by Dr H.T. Pagden, the Senior Entomologist of the Department of Agriculture, and *Replanting and Malaria* from the Malaria Advisory Board, both of Kuala Lumpur. Other guest articles are planned.

As this issue goes to press we have sad news to announce, the death on Tuesday, 17 March, of our Deputy Director, Charles C. T. Sharp, Esquire. An obituary notice appears on page 70.

Stump Planting

THERE ARE THREE MAIN CLASSES OF STUMPS used in rubber planting:

Seedling stumps Budded stumps Stumped buddings

The first two are commonly used instead of seed at stake or basket plants, particularly in coastal districts where the soil tends to keep moister than the deeper draining inland soils. Before proceeding further with a consideration of stump planting, it will be as well to be quite clear what sort of material each one of these classes is.

Seedling Stumps are made from seedling plants. They may be either unselected seedlings for later budding in the field or selected seedling material destined for growing to maturity as seedling trees. Seedling stumps can be satisfactorily transplanted over a wide range of development. Very small stumps are called pencil stumps. These are about $\frac{1}{2}$ to $\frac{3}{4}$ inch in diameter at the collar, that is at ground level where the plant structure changes from its aerial to its subterranean form. Normal sized stumps in commercial practice are 1 to $1\frac{1}{2}$ inch in diameter at the collar, but considerably bigger stumps can be successfully transplanted though the cost of pulling and holing will be higher.

Budded Stumps are seedling plants onto each of which a bud of a selected clone has been grafted. The usual size is 1 to $1\frac{1}{2}$ inch in diameter at the collar. They may be larger than this but, as for the seedling stumps, the use of larger stocks will involve more trouble and expense. Seedlings destined to become budded stumps can be budded at any time when they are large enough to bud; that is usually about one inch in diameter at the budding height, four inches from the ground.

Stumped Buddings are frequently confused in name, if not in practice, with budded stumps owing to the inversion of the words. They are made from seedling plants which have been budded and cut back so that the bud shoot has grown; this has then in its turn been cut back to become a stump.

PROS AND CONS OF STUMP PLANTING

There are, of course, advantages and disadvantages associated with the use of any of the kinds of stump. The main advantages for their use are:

For seedlings: an excellent opportunity is offered for culling runt plants, a necessary task that otherwise could only be done in the field by a greater expenditure of time and money. Such a selection means also that a lower initial planting density in the field may be established with lower costs for lining and holing.

For buddings: easier though not necessarily more successful budding. Nursery budding rates are always lower than field budding rates. Second round supply budding which can also be done in the nursery is more easily accomplished.

Against the use of stumps are certain disadvantages:

A check in growth and inevitably some casualties, however well the work has been done and however favourable the weather. Though these casualties need not necessarily be numerous, they will involve supplying to mend over the stand in the field.

The cost of field planting of stumps will be higher than with planting seed at stake or basket plants.

Whether the savings which can be effected on some items outweigh the extra expenditure on others is not the purpose of this article. Each case can only be decided on the facilities of land and labour and the experience of former plantings. One point may be specifically mentioned, and that is that in our experience there has been little or no advantage by the twelfth year of life in the field between budded stumps and any of the following planting materials budded in the field: seedling stumps, seed at stake and basket plants. The initial advantage of age has not been maintained in two trials conducted on coastal clay and one on inland soil. On an inland estate stumped buddings were still giving a higher yield in the twelfth year of life in the field than other forms of planting but the advantage was decreasing annually.

NURSERY LAYOUT

The layouts described below can be varied to suit local conditions but are suggestions to cover an essential link in the process of producing stumps. Unless very large quantities of stumps are required, it is usually convenient to set up nurseries in odd corners on the estate. Frequently ravine bottoms make good sites. Briefly the requirements are flat land, sheltered but not overshaded, and proximity to water. The planting density varies with the type of material it is intended to grow.

Pencil stumps may be planted at 9 in × 9 in omitting every tenth row, to divide the area into beds. Thinning of weak plants is carried out over two rounds during which time thirty to fifty per cent of the original stand is culled. In the end, about 2600 to 3600 seedlings per square chain should be available. An average time for development is eight to ten months.

To produce vigorous *normal sized seedling stumps* more space must be allowed. Germinated seed may be planted at 1 ft × 1 ft omitting every third or fourth row. Thinning of about thirty per cent of the original stand should be undertaken if the material is intended for budding in the field. This should give 2000 to 2200 stumps per square chain in about twelve months' time from planting.

If the nursery material is selected clonal seedlings for growing as such in the field, the extent of thinning will depend on the vigour of the seedlings and on their origin. Probably thinning up to fifty per cent of the original stand should be carried out over two rounds. Such thinning would be based on vegetative characters. Tests for determination of yield, such as pricking the bark and assessing the seedlings into grades by the length of flow of the drops of latex, have not in our experience proved helpful.*

For *budded stumps* it is usual to allow more space between the plants for convenience of budding though the final development of the plants is no more than for normal seedling stumps. Germinated seed planted in pairs of rows on a 9 inch triangular spacing with 2 ft between the centre of the pairs is a suitable arrangement. Any division into beds of different clones can thus be made between the double rows.

Thinning should be undertaken at about six months from planting and again according to the subsequent growth before budding is undertaken to reduce the stand by about thirty to fifty per cent of the original.

* *R.R.I. Report for the period September 1945 to December 1948, page 44*

Two rounds of budding may be undertaken, but a third round on stocks which have failed twice previously is not recommended. When more than one clone is budded suitable marks and a plan should be made to show the beds of each clone.

With a complete budding success there should be about 2000 to 3000 budded stumps per square chain at approximately one year after planting. They may be kept for a considerable time as budded stocks, until they are required for use. The only precaution that is then necessary is to ensure that the callus between the edge of the budpatch and the bark of the stock does not force the budpatch to become detached from the stock. If the budding has been done expertly and the budpatch fits neatly into the area of the excised flap of stock bark this trouble is not likely to arise. If, however, it is evident that a ridge of callus growth is forming around the sides of the patch, the danger may be allayed by paring down the callus. There should be no necessity for this, if the stumps are to be used within four months or so of budding.

Stumped buddings require the most nursery space. A suitable planting distance is 9 in × 2 ft with germinated seed. Thinning out of thirty to fifty per cent of the stand should be undertaken in two rounds before budding. After budding is completed, all stocks not successfully budded should be removed. The others should be cut back, and when the scion shoot has started to form wood the stock snag should be pruned as described later. After twelve to eighteen months from cutting back, 1500 to 2000 plants per square chain should be ready for use.

Often stumped buddings are required for supplying an area previously planted with budded stumps. It is then convenient to remove every alternate budded stump for the original planting leaving a sufficient remainder to grow for use later as stumped buddings. The spacing of this remainder should be about 2 ft × 3 ft.

NURSERY MANURING

The initial manuring of a nursery should be done with rock phosphate and magnesium lime, worked into the surface of the bed to a depth of six to nine inches. Suitable dressings are 3 cwt per acre of Christmas Island rock phosphate and 1 cwt per acre of magnesium lime. Subsequently, sulphate of ammonia and muriate of potash, mixed in the proportions 4 : 1, should be applied on the surface one month after planting germinated seed, at the rate of 1½ oz per running yard between planting rows. A similar application can be given at four to five months from planting.* For stumped buddings, at four to six months after budding, mixture M may be given at 2 oz per running yard between planting rows.

CUTTING BACK

When the time has come for field planting and the material in the nursery is ready, one of two courses may be followed.

If there is any possibility of the stumps drying out, either through there being a delay of a few days between pulling and planting or if there is likely to be a break in the weather leading to drier conditions, it is recommended that cutting back and pulling be done at the same time. Stumps so planted may be rather slow in coming away since the

* *Advisory Leaflet on Manuring of Nurseries, S/AL 11(51)*

buds are dormant, but if the stumps experience even slight drying, it is better that they should be so. Fresh, sappy shoots which come from growing buds will suffer many casualties if the stump is incapable of maintaining the water concentration in them as well as replacing that which is lost by transpiration from the green tissues.

Should the season be favourable and be likely to remain so for the following month the alternative course is recommended. About seven to ten days before planting is to be done, the plants are cut back to the appropriate height. Towards the end of this time the buds at the top end of the stump, or the bud on a budded stump, should begin to swell and then to become green at the centre. This indicates the commencement of shooting and is the time when the stumps should be pulled. The swelling buds which have been stimulated into activity by the cutting back will continue to grow after transplanting. In wet weather the roots are soon re-established and there is only a slight check in the growth.

This is the method to be adopted in the main planting season when regular falls of rain can be expected, but in offseason planting it is risky as dry spells and insufficient rainfall are likely to lead to the death of tender shoots borne on stocks with unestablished root systems. Whereas it may not be so vital for seedling stumps or for stumped buddings which have a number of other buds available should the young shoots die, budded stumps have but one chance, they either survive the first time or else die and become entirely useless.

In considering which course to adopt, it should be remembered that once having cut back a budded stock for use as a stump, it must be pulled at some time before the bud has come away as it cannot be moved while it carries a young green shoot. A seedling cut back for use as a stump, or a budding for use as a stumped budding can however be left in the nursery should a change of plan be necessary. When planting is finally decided upon, all that is required is that the green shoots be pruned off or the stem below the lowest shoot be cut through. The stump may then be pulled immediately or left for a few days till other buds begin to swell. In stump planting it is not imperative that one course or the other be rigidly adhered to. The time of pulling after cutting back may be varied within the ten day period to suit the distribution of work as well as the weather conditions.

The height of cutting back may vary within limits according to requirements and opinion. Normally, approximately the following are adopted:

Pencil stumps ($\frac{1}{2}$ in – $\frac{3}{4}$ in diameter) 12 to 15 in
Seedling stumps (1 in – $1\frac{1}{2}$ in diameter) 18 in
Budded stumps 4 in to 6 in above the top of the bud patch
Stumped buddings 4 ft to 5 ft above the union.

The upper limit of the height for cutting back seedling material and stumped buddings is restricted by the extent to which cork formation on the bark has occurred. Under no circumstance should green or mottled green brown bark be left on the stump below the point of cutting back. Green bark is capable of transpiration and if any remains on the stump, the stump will soon be depleted of water. Many such stumps may die.

The lower limit of cutting back is decided mostly by expediency. It is wasteful to cut off too much of the stem. In young and vigorous

pencil and seedling stumps the leading bud shoot which takes over the growth of the stem will quickly form an inconspicuous callus over the cut end of the stump. There is therefore no particular need to avoid, should it be possible, the future tapping panel. Stumped buddings should preferably be cut back above panel height since owing to the older age of this material the callus growth may persist. The height of cutting back of budded stumps is fixed by the height of the bud patch. It should be about four to six inches above the patch. Only in unusual circumstances when delay in the shooting of the bud is desired would it be practicable to cut back at a greater height. This might anyhow be unsatisfactory.

PULLING

This word is literally correct: rubber stumps are pulled, and will survive what appears at first sight to be casual ill handling. In wet weather when the soil is soft, pencil stumps and small seedling stumps can be pulled without any preliminary digging; only if the soil is at all dry or if the soil is stony, when the taproots may have grown crookedly around stones, is it at all advisable to loosen the soil, and even then it is probably sufficient to do so on one side of the plant only. Larger stumps may need more digging to extract them from the soil, but never much. If at the time of pulling the buds have begun to swell, it is advisable that the stumps should not be grasped at the top end or over the bud patch, but lower down to avoid damage to the soft tissue of the buds.

A certain amount of pruning is necessary for ease of handling the material after pulling and for fitting it into the planting hole. The optimum extent of the roots left on the stump varies with the size of the stump. *The whorl of lateral roots which grows out just below the collar should never be trimmed right off* as these roots play an important part in the re-establishment of the stump in its new growing site. A general indication of the length of taproot and laterals to leave is:

	Tap root	*Lateral roots*
Pencil stumps	9 to 12 in	3 to 4 in
Seedling stumps	15 to 18 in	4 to 6 in
Budded stumps	15 to 18 in	4 to 6 in
Stumped buddings	24 to 30 in	9 in

Provided the lateral roots are not cut to less than these lengths, there is normally no benefit to be gained by the use of root inducing hormones. Establishment is as good without treatment.

Only small stumps have been found to grow better as a result of treatment with growth substance. Large stumps showed no such response, and as a whole stumps with six to twelve inches of lateral roots suffered retardation.*

At the time of root pruning an examination should be made for evidence of root diseases. Any stumps that show sign of infection should be discarded.

If the stumps will not be planted for several days after pulling, it is advisable to leave them standing for a few hours or overnight in fresh water, after pulling and root trimming.

* *R.R.I. Annual Report for 1939, page 84*

A wound dressing to the cut end of the roots is not specifically necessary. If a grease is put on, it should not be more than a thin smear. Alternatively, if the stumps are going on a journey of a few days the root ends may be dipped in low melting point wax. If either of these is applied, the coagulated latex from the cut surface should first be removed.

PACKING FOR DESPATCH

No packing is necessary if the stumps are to be used on the same estate, provided they can be handled with reasonable care.

When there is to be long lorry transport or despatch by train some form of protection must be arranged. Probably the most convenient way is to tie the stumps head to tail in any quantity that gives a bundle of such a size that it is easily handled by one man. Each bundle is then covered with a layer of fresh cut damp lalang, which acts as a cushioning and also helps to keep the stumps from desiccation. The whole is then rolled up in a cover of sacking.

Budded stumps need rather more careful precautions against damage than seedling stumps or stumped buddings. In particular if the bud has been allowed to swell, by cutting back before pulling, some covering to the bud should be provided. In practice convenient material to use is small sections of the leaf petioles which make up the stem of a banana or plantain. These may be cut to a suitable size to cover the bud patch and tied on with string.

PREPLANTING TREATMENT

If the stumps are to be planted immediately after pulling and trimming, there is nothing special to do before planting them.

Stumps which have had a grease wound dressing should have all excess of grease removed and those which have been waxed should have the lower half to one inch of the tap root cut off to remove any discoloured wood. After this the stump should be allowed to soak in water for a few hours before planting.

PLANTING

Planting should follow pulling as soon as possible. Planting in prepared holes is better than crowbar planting. The size of the hole must be made to match the size of the stump, and may be as much as three foot cube for large stumps An economical and practical compromise between crowbar planting and proper holing is to dig a hole slightly more than large enough to take the lateral whorl of roots without bending them, and to make the necessary extension for the tap root from the bottom of the hole by crowbar. By this method a 12 to 18 inch cube hole is usually considered adequate for seedling or budded stumps, and for large stumps one of about 24 inch cube.

The stump must be sufficiently deeply set for the lateral whorl of roots to be well covered by soil, but not too deeply, even though the soil may in time settle. The stump re-establishes itself by growth from the basal end of the tap root and from the ends of the laterals. It is essential to ensure first that soil is firmly appressed to the end of the tap root, as an air gap there may lead to slow recovery. This can be done by tamping the soil at the base of the hole before filling in. In the

hole itself the soil should be so compacted that the stump needs a strong pull to shift.

MANURING OF STUMPS IN THE FIELD

Manuring in the field can follow the programme given in *Circular No. 30,* using rock phosphate in the planting hole mixed with the top eight inches of soil. The next dressing of fertilisers can be given four to six months after planting, using mixture M or X according to the soil type, scratched into the surface soil.

AFTER PLANTING CARE

Pruning — When seedling stumps or stumped buddings begin to grow, they will put out a number of side shoots from the top end of the stem. When the largest have reached a length of about four or six inches it is time for a round of pruning. Two or three of the most vigorous shoots on each plant should be left and the rest cut off flush with the stem. At this stage it is not advisable to prune leaving only one shoot as still being water shoots, sappy and tender, they are liable to damage. Leaving two or three to grow for a while gives a better chance of having in the end one good shoot per plant.

When these shoots have been growing for a further month or two and the wood at their lower end has hardened, a second round of pruning may be done to leave only the most vigorous shoot to grow. This will form the crown of the tree. When establishment is slow it is often necessary to undertake further pruning of side shoots as they appear.

On a budded stump only the bud shoot is wanted. On stumps which have been pulled and cut back at the same time, many stock shoots are likely to grow. Regular rounds of careful pruning are necessary to ensure that only the bud shoot grows, for once a stock shoot has established control over the plant the bud will not come away but will remain dormant.

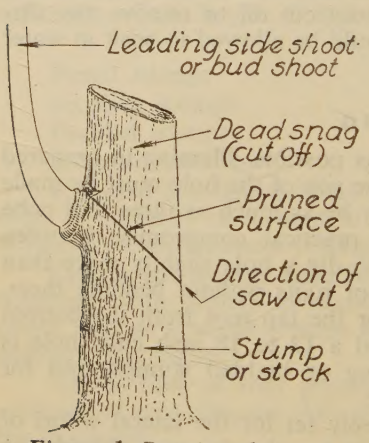


Figure 1. Pruning the snag.

*Snagging** — The top end of the stump below the level of the shoot will presently die. On small vigorous seedlings there will probably be no necessity to do anything about this snag as it will fall off and the place heal over quickly. If this does not occur by the time the new shoot has got well away it would be advisable to prune the snag. This is best done at an angle of 45° starting from the side opposite the shoot and cutting upwards so that the shoot is at the top end of the wedge, as in *Figure 1.*

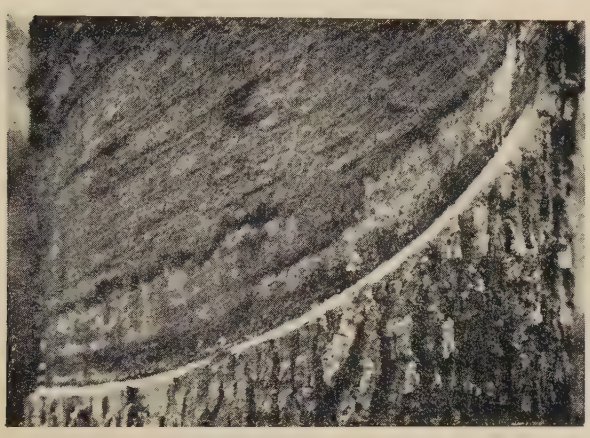
BOTANICAL DIVISION

* *Advisory Leaflet B/AL 21(47)*

Mouldy Rot

MOULDY ROT DISEASE OF THE TAPPING PANEL causes considerable damage throughout Malaya, particularly during the wet season. If left untreated, the damage may be so severe that renewed bark is unfit for tapping. It is most prevalent in areas where the atmosphere is continuously damp, owing to the lie of the land, close planting, or density of the undergrowth. Because the causal fungus is unable to survive in conditions of low humidity, the attack usually passes with the advent of dry weather.

Symptoms — The first indication of the disease is the appearance just above the tapping cut of a series of slightly depressed discoloured spots, which later darken and become covered with a greyish mould. The subsequent enlargement of these spots leads to the formation of an irregular band of infection running parallel to the cut. The progress of infection is rapid and as the soft bark tissues are destroyed, wounds exposing the wood may be developed within a few weeks. In general appearance these wounds resemble those produced by bad tapping.



Tapping panel attacked by mouldy rot

The causal fungus — This is *Ceratostomella fimbriata,* a fungus with an olive brown mycelium that gives rise to three kinds of spore:

(*i*) Colourless thin walled cylindrical spores, produced in great profusion on the surface of the newly tapped bark, and chiefly responsible for the characteristic mouldy appearance of infected panels.

(*ii*) Olive brown thick walled spherical spores formed in relatively small numbers either on the surface of the bark or within the diseased tissues; these enable the fungus to survive periods of dry weather.

(*iii*) Colourless thin walled spherical spores, produced in black flask shaped bodies; these are rather rare.

Another fungus, a species of *Fusarium,* is not uncommonly found in association with the *Ceratostomella.*

Spread of the disease — The disease is spread mainly through the agency of tapping knives and clothing contaminated with spores, though insects and air currents undoubtedly take part in its more local dissemination.

PREVENTION

As the fungus is unable to infect anything but newly tapped bark, outbreaks of mouldy rot in areas particularly liable to attack—because they are low lying or adjacent to infected fields—may be prevented by resting the trees during the wet months.

On the other hand, since the disease is so dependent on humid conditions and the slow drying of tapping panels for its development, it is often possible even under continued tapping to prevent it appearing in a susceptible area by keeping the undergrowth well under control during the whole of the wet season. As a further precaution it is desirable to avoid the introduction of the disease on infected tapping knives or clothing; this means that tappers should not be employed in a healthy area alternately with an infected one.

CONTROL

The results of our experiments convince us that the control of mouldy rot is a perfectly feasible operation, provided that the better fungicides are used and applied sufficiently frequently. Treatments with aqueous preparations at weekly or longer intervals are little better than a waste of money, as they are most unlikely to secure control. Applications of lime, or of cowdung and clay, do not cure the disease but merely obscure it.

First it is necessary to cut back excessive undergrowth in the infected fields, then to treat the panels with the fungicide selected. A list is given below of locally available preparations officially approved for the treatment of mouldy rot; aganist each is shown the source of supply in Malaya and the standard packing sizes. The concentrations at which they should be applied are also given, and where there is a range it is advisable to start with the lower strength; if this fails to secure control the concentration can be increased, but the stated maximum cannot be exceeded without danger of bark burning. Fylomac 90 is soluble in water; all the others are water miscible.

Name	*Agents*	*Standard Packings*	*Recommended Concentration*
Fylomac 90	Imperial Chemical Industries (Malaya)	10 lb	0.28%
Killgerm	McAlister & Co	5 gal	5 - 10%
Paragerm	Lindeteves (Malaya)	1, 5, 10, 40 gal	5 - 7½%
Izal	Guthrie & Co	1, 5, 10 gal	3 - 5%
Black Cyllin	Sandilands Buttery & Co	5 gal	5 - 10%
Ialine White Disinfectant	Harrisons & Crosfield (Malaya)	1, 5, 10 gal	5 - 10%

Name	*Agents*	*Standard Packings*	*Recommended Concentration*
Ialine Ordinary Disinfectant	Harrisons & Crosfield (Malaya)	1, 5, 10 gal	5 - 10%
White Septol	George Blunn & Co	1, 5 gal	5 - 10%
Brunolinum Plantarium*	James Warren & Co	1, 5 gal	10 - 15%
Agrisol (Ordinary)	Sime, Darby & Co	1, 5 gal	15 - 25%
Kilsol Red	Kyle, Palmer & Co	1, 5 gal	5 - 10%

Method of application of the fungicide — For application of these aqueous materials we recommend spraying in preference to painting, both for the increased facility of the operation and for improved coverage. In our experience it has also worked out rather cheaper. The spray should be directed so as to apply the fungicide over a broad band two thirds above the cut and one third below. If a brush is used, the first two or three applications should be made over a band extending four or five inches above the cut; thereafter treatment may be confined to the most recently tapped two or three inches of bark, the lower limit of the painted strip being as near to the cut as possible.

The preference for spraying assumes that sprayers of suitable design are available. From trials with a number of different types it has been concluded that what is needed is a fine spray at a low rate of delivery (less than ½ pint per minute) in a narrow cone (6 inches diameter one foot from the nozzle). To avoid overfrequent filling in treating large areas the sprayer should have a capacity of 1½ to 2 gallons, held in a knapsack container. Where the container is pressurised, the trigger in the spray lance should be of the type that discharges when it is depressed and closes when released.

Number of applications of the fungicide — The number of applications required to bring the disease under control will depend on prevailing weather conditions, effectiveness of the fungicide, and whether or not the trees are in tapping.

To bring the disease under control while tapping is continued, all trees in an infected task should be treated after every tapping. Up to twelve applications may be needed. Under the alternate daily system it will probably be found most convenient for treatment to be made on the day following tapping, so that the labourers doing the work can put in a full day. A delay of 24 hours in applying the fungicide is not as serious as it might seem, for with good tapping much of the cut is effectively protected by the scrap. As this must be removed before treatment is applied, the labourer's time will be saved if scrap collection is done by a podian who goes ahead of him.

* *An improved form of this product has been tested and recommended for gazetting as an approved fungicide.*

Control of the disease will be easier if trees are taken out of tapping, as there will not be the continual exposure of fresh bark to infection. The frequency of treatment may then be reduced to every four days, but on re-opening the cut it is recommended that applications be made after each of the first two or three tappings, to prevent infection from spores present in the untapped bark. On no account should a new cut be opened a few inches below the old one, since the subsequent yield of the renewed panel might be adversely affected.

Systematic eradication – The way in which we think sprayers should be used to deal with an extensive outbreak is illustrated by the plan given below, drawn up to deal with 700 infected acres by employing eight pneumatic hand sprayers—sufficient to treat 120 acres a day—as follows:

(*i*) Cut back the undergrowth throughout the area.

(*ii*) Concentrate the eight sprayers on cleaning up 240 acres by alternate daily treatment.

(*iii*) On completion of (ii), detach two sprayers to work through the 240 acres and treat any new cases that appear, concentrating the remaining six on alternate daily treatment of a further 180 acres.

(*iv*) When the second area has been cleared up, detach two sprayers to work through it and concentrate the remaining four on alternate daily treatment of a further 120 acres.

(*v*) By the time the last area has been cleared up there will remain about 160 acres to be treated. At this stage it should be possible to bring in two or three of the 'roving' sprayers from the first treated fields and clean up the area in one further alternate daily operation.

Assuming that the disease can be brought under control by twelve alternate daily applications (which we know by experience is fully justified) such a campaigan could be completed in about three months.

Additional precautions — If the disease has been particularly widespread or unusually intractable it will be advisable to continue treatment after control has been obtained, with application following every third or fourth tapping day so long as the wet weather lasts.

All knives, bags for carrying scrap, and other utensils used in infected areas should be disinfected by immersion in a solution of the fungicide.

Excessively deep tapping is generally held to favour the incidence of mouldy rot and should therefore be avoided.

Supervision — To assist supervision, the fungicidal solution can be coloured by addition of methylene blue at the rate of one ounce to ten gallons. In some fungicides a dye has already been incorporated.

Reprints are available of this article, which replaces our advisory leaflet on mouldy rot: P/AL 2 (50).

PATHOLOGICAL DIVISION

Latex Anticoagulants

A LATEX ANTICOAGULANT is a material which is added to latex in order to prevent coagulation occurring by natural means before the collection reaches the factory for processing. Anti-coagulants are particularly valuable for use in wet weather and with latices showing a tendency to precoagulation. Materials which have been used for this purpose include sodium sulphite, ammonia and formalin. Information concerning the use of these three substances is given in the following notes, which are not intended to be comprehensive but summarise dosage requirements, method of application and precautions to be adopted, together with the particular merits and disadvantages found with each material.

All three anticoagulants can be used with reasonable assurance for the preparation of sheet. Sodium sulphite is effective in retarding the natural coagulation of latex, but is of little value when precoagulation is marked. Ammonia is recommended as a general purpose anticoagulant and especially for abnormal precoagulation, as in rainy weather, with young trees or particular clones (*e.g.* AVROS 49, and Glenshiel 1 under certain conditions. Formalin is not so effective as ammonia in wet weather or with certain clonal latices. This difficulty is usually overcome, however, by adding a little sodium carbonate to the latex in addition to formalin.

When the final product is pale crepe rubber, however, considerable care is called for, as colour may be adversely affected both with ammonia and formalin.

All anticoagulants should be added as soon as possible after the latex flows from the tree, and addition to tapping cups is desirable. In practice it is difficult to ensure that this is carried out satisfactorily and it is advisable to compromise by adding half the quantity to the cups and the remainder to the tapper's bucket. Anticoagulants should not be added in the factory as they do not counteract the results of precoagulation, although some times the addition of formaldehyde assists in sheet preparation by inhibiting fermentation and thus avoids the formation of bubbly sheet.

Sodium sulphite — This is supplied commercially in the form of a white powder; samples available in Malaya are usually 90 to 98% pure (as Na_2SO_3). The powder is not stable under tropical conditions and should be stored in a cool place in airtight containers. A stock solution is prepared by dissolving 1 lb commercial sodium sulphite in 3 gallons of water. Solutions of sodium sulphite deteriorate rapidly during storage and should therefore be used on the day of preparation. The dosage for short period preservation is ½ pint stock solution to 4 gallons of latex; this is equivalent to about 0.05% sodium sulphite on the latex.

The use of sodium sulphite in latex retards the drying of sheet. Excess sodium sulphite leads to tackiness on the surface of sheet, which is due to moisture and not to oxidation.

Ammonia — Ammonia is available locally in large cylinders containing about 150 lb gas, which is sufficient for treating latex to give 500,000 lb rubber. To prepare a stock solution, 1 lb ammonia gas is bubbled slowly into 10 gallons of water providing a 1% solution (approx). Smaller quantities of ammonia can be purchased locally in the form of a concentrated solution containing approximately 30% ammonia by weight. A 1% solution can be prepared by stirring 4½ fluid ounces of the concentrated solution into 1 gallon of water.

For use as an anticoagulant it is recommended that 0.01% ammonia should be used on the latex; in practice this amounts to adding 6½ fluid ounces of the stock solution to 4 gallons of latex. The use of excess ammonia in latex causes difficulty in coagulation leading to uneven sheets and trouble in drying.

Ammonia evaporates from solutions on exposure to air and containers should be tightly stoppered. Unopened drums of ammonia solution should be stored in the coolest place available, and immersed in water overnight before being opened. The stopper should be loosened slowly and any pressure allowed to escape before removing it completely. It is advisable for persons using concentrated ammonia solution or ammonia gas to wear goggles. The concentrated solution is also caustic and parts of the body contaminated should be quickly cleansed in water.

Formalin — Formalin, as commercially available, is a 38% (approx) solution of formaldehyde. This oxidises slowly during storage to form an acid; before use it is advisable to neutralise any acid present by adding a little soda ash. The neutralising reaction can be tested with litmus paper which turns blue in alkaline and red in acid solutions; when neutral, formalin has little or no effect upon the paper, which remains purple in colour. A 1% stock solution is prepared by stirring 4 to 5 fluid ounces of formalin into 1 gallon of water. The normal dosage is at the rate of 3 fluid ounces of stock solution to 1 gallon of latex, which is equivalent to 0.02% formaldehyde in the latex.

In abnormal latices formalin is used together with sodium carbonate. A stock solution of the latter is prepared by dissolving 1 lb soda ash in 10 gallons of water and is employed at the same rate as formalin, *i.e.* 3 fluid ounces of stock solution per gallon of latex.

Extra acid should not be required for coagulation if formalin is used alone, but when sodium carbonate is also present, slighty more acid may be required.

This article supercedes Advisory Leaflet C/AL 15 (52), reprints are available on request.—Editor

CHEMICAL DIVISION

R. R. I. News

Budwood of sixteen R.R.I. clones has been sent to the Rubber Research Institute of Ceylon, to test clones derived from PB 86 seedlings for resistance to mildew (*Oidium*).

o

Three hundred seedlings of a blight resistant clone, FX 25, have been established in a nursery. The seed was obtained from the U.S. Department of Agriculture, Panama, *via* quarantine at Kew.

o

176 new clones are on smallscale trial at the Experiment Station. They have been established from the 1950 hand pollinated seedlings.

o

Concentrated latex prepared from trees injected with copper salts or treated with bark stimulants has shown no abnormalities.

o

Methods of improved bare back baling are being studied. Trial shipments in fibreboard cases have been arranged.

Rhinoceros Beetle:

A Warning

PER-WAR PLANTERS OF COCONUTS or oil palms will probably remember that serious and widespread damage by the rhinoceros or black beetle (Oryctes rhinoceros) was of rare occurrence, at least on the larger estates. The writer can recall only a few cases in the twelve years immediately before the war when attack by this beetle caused serious concern. In one case investigations showed that a severe outbreak on a coconut estate had its origin in breeding sites created by felling and replanting operations on a neighbouring rubber estate: after felling, the old rubber had been allowed to lie and rot, and it was necessary to take action under the Agricultural Pests Enactment to enforce the destruction of the breeding sites thus created. In the other case a sawmill was responsible, the piles of old sawdust being full of grubs.

Compared with other countries in which the rhinoceros beetle occurs naturally, Malaya was, in pre-war years, comparatively free from damage by this insect. It was, indeed, unusual to see any considerable area of palms showing symptoms of attack and if such were seen action was always taken to find and destroy the breeding places.

WHY WAS MALAYA SO FREE

The reason for this comparative immunity of Malaya from serious outbreaks of the rhinoceros beetle was the enforcement of that section of the Agricultural Pests Enactment dealing with the breeding places of this beetle. These are refuse heaps, manure heaps, compost, sawdust (particularly when it contains pieces of rotting timber), oil palm refuse, dead and decaying palms, heaps of rotting palm fronds, dead and decaying timber such as felled jungle and particulary rubber, in fact almost any rotting organic matter of vegetable origin. The danger from felled coconut palms was particularly recognised and the use of coconut timber for building purposes, the construction of footbridges over drains *etc* was prohibited under the Enactment. The writer well remembers finding enormous numbers of rhinoceros beetle grubs in tank obstacles, dugouts and machine gun posts constructed for beach defence in Singapore in 1940-1, in all of which coconut timber had been used.

It would be difficult to choose any one of the sites mentioned as being a greater potential danger than the others. Clearly, for example, an area of felled rubber situated in the middle of a large unbroken area of this crop, with no palms of any sort within miles, would be unlikely to breed rhinoceros beetles because the adult beetle must have palms of some kind for its sustenance. Rubber logs are known, however, to form an ideal breeding place, and this has been well known since 1935.

The importance of preventing breeding was fully appreciated and it was rarely necessary to take steps to enforce the destruction of breeding sites. Estates saw to it that such did not occur.

WHAT HAPPENED

During the Japanese occupation of Malaya estate sanitation virtually ceased to exist. Much indiscriminate felling was done for planting food

crops, and possibly for other purposes, and although some of the felled timber was probably taken for firewood much of it was allowed to lie and rot. Where this happened in the vicinity of coconut or oil palm estates a great increase in the population of rhinoceros beetles followed, and nothing was done to check it. Likewise, there was no check on the activities of sawmills, and these added their quota to the breeding places.

POST WAR

In 1946 this danger to coconut and oil palms estates, arising from the restoration of rubber estates by replanting, was appreciated officially*, but shortage of staff made it impossible to clean up all breeding places.

At about this time some estates began to replace existing rubber, as it became old and uneconomic, by oil palms. Labour costs were high and felling and burning were considered far too expensive. The cheapest method of getting rid of the unwanted rubber was sought and this appeared to be to poison it with sodium arsenite.

So far as the writer is aware in only one case was serious consideration given to the possibility of an increase in numbers of the rhinoceros beetle resulting from this policy. This was not connected with a change from rubber to a palm crop. but with poisoning rubber preparatory to replanting on estates adjoining existing coconut estates, with the possibility of a subsequent outbreak of beetle on the coconuts. Poisoning was advised against unless the dead rubber were removed. This advice was accepted and the not inconsiderable extra cost has not been regretted.

The first repercussions of this policy, the poisoning of rubber and its replacement by oil palms, were reported to the Department of Agriculture in February 1949 when a letter was received stating that considerable damage was being caused to two year old oil palms by the rhinoceros beetle. The report added that there was a considerable area of poisoned rubber nearby but the manager had not found beetles in the rubber. No further information was received about this outbreak and it was not possible to visit the area at that time. It seems probable, however, that the rubber was the cause of the outbreak. The letter stated that beetles had not been found, and it may be that the grubs were not recognised.

In January 1951 a report was received from an estate which had embarked on a large planting programme of oil palm, to replace old rubber. Their $2\frac{1}{2}$ year old palms were suffering severely from beetle attack. A visit was paid to this estate and widespread damage by rhinoceros beetle was found, many of the young palms having two or more beetles present in the crown. The old rubber had been poisoned and the rotting trunks of the trees were lying on the ground throughout the whole area; decaying rubber stumps were still standing. Grubs of the rhinoceros beetle were found in enormous numbers, both in the standing stumps and in the fallen trunks.

More recently, in October 1952, another case came to notice, and again the oil palms were $2\frac{1}{2}$ years old. On this estate not one young palm was seen which did not show some evidence of past damage by rhinoceros beetle and many had been attacked very recently. Some of

* *Agricultural Leaflet No. 26: 'The Black Beetle — A Pest of Coconut Palms' (Department of Agriculture, Federation of Malaya)*

these palms were only about three feet high and a number had been so severely damaged that supplying had been necessary, but the supplies had immediately been attacked by the beetle. Again the palms had been planted among poisoned rubber and many of the stumps were still standing to a height of fifteen or more feet. Rhinoceros beetles were breeding in this poisoned rubber, up to thirty large grubs being found in a single stump.

In the same month the writer visited another estate where similar conditions prevailed, but no field inspection was made because the manager had already located the source of the trouble and was employing children to collect the grubs, and also the beetles from the young palms. Some two hundred adult beetles were brought in, the result of the morning collection, while the writer was present.

CONCLUSIONS

Four cases of serious damage to young oil palms by rhinoceros beetle have been recorded above. Three of these have been definitely traced to breeding sites provided on the estates concerned by poisoning rubber and leaving it to rot *in situ*, and it seems probable that the other case, which occurred first, was also due to breeding sites provided by poisoned rubber.

These severe outbreaks on oil palms are unusual. Pre-war records of severe damage by this beetle have all been on coconut estates and there seems little doubt that when both palms are present the coconut palm is preferred by the rhinoceros beetle. Furthermore, past experience suggests that the oil palm is better able to withstand attack than is the coconut palm; it is rare to see old oil palms showing the typical fancut fronds which today are not uncommon with coconuts. It has generally been believed that rhinoceros beetles do not cause serious damage to oil palms after they are 2 to 2½ years old. In one of the cases recorded however, palms which have reached 2½ years are still being severely attacked and have become so stunted as a result that it seems that attacks will continue to be severe just as long as breeding can continue in close proximity to these palms.

The conclusion to be drawn is that there may be serious danger to oil palms, as well as to coconut palms, and particularly to young plantings where these are in replacement of, or in close proximity to, dead and decaying rubber.

It is not disputed that poisoning with sodium arsenite is a cheap and easy way of killing unwanted rubber. But it may, in the long run, be a costly procedure if palms are planted in replacement or are already present in neighbouring areas. Whether the ultimate cost then will exceed that of the older practice of felling and burning is for those concerned to decide. In comparing costs it is necessary to consider not only the immediate outlay but also the losses incurred by beetle attack, both directly by killing the young palms or by causing them to be so stunted that supplying becomes necessary on a large scale, and indirectly by retarding their development and considerably delaying the time when they become productive.

H.T. Pagden

Contributed by the Senior Entomologist of the Department of Agriculture, Malaya

Soil Organic Matter and Krilium

IN THE *Manual of Rubber Planting* A.T. Edgar states 'The value of a soil is determined by a number of conditions prominent amongst which are

1 Water supplying capacity
2 Plant food supplying capacity
3 Oxygen supplying capacity
4 Absence of harmful factors.'

Soil structure, by which is meant the physical arrangement of individual mineral and organic particles in the soil, is intimately connected with (1), (3) and sometimes (4) above.

There are four main factors that can be conducive to good soil structure, all of them connected with the binding together of mineral particles into porous aggregates to prevent them becoming a more compact mass when the soil is disturbed by cultivation or pushed aside by growing plant roots that later die and rot away. The binding materials may be iron oxides, clay minerals, organic matter and soil conditioners. The first two cannot be altered by any economic process, and the aggregates formed by cohesion between clay particles by themselves are weak when wet. The two others, decomposing organic matter and soil conditioners, can be influenced by methods of agriculture or more directly by application of the material to the soil.

Only a very small proportion of organic matter in leaf fall penetrates sufficiently into the soil to have much effect on soil structure, and most of the useful portion comes from dead roots. There is a balance, in any long established field where conditions have remained the same for some years, between production of organic matter and loss by oxidation. If the loss can be reduced by adequate means another state of balance will be produced in which the soil structure is more favourable to plants. The state of balance occurs because, if there is sufficient air present, the more organic matter there is, the greater will be the quantity decomposed. If air is absent there will be a steady build-up into peaty conditions.

Because loss of organic matter is greatly reduced if the soil is kept cool, the use of vegetation or mulches for shading is advantageous. Also measures against erosion are required to prevent loss of the surface soil, which is the richest in plant foods and organic matter. Creepers or grass as soil covers are most often used for this purpose. Thus covers are of value to a soil by both reducing loss from erosion and by increasing the addition of plant residues. In Malaya, grasses are not the best covers for improving soil structure, and their highly competitive nature weighs against their use for this purpose when grown near rubber trees. The choice is therefore between leguminous creepers which are probably better and the natural undergrowth which is cheaper.

The complex organic carbon compounds of a plant are not built up from decaying organic tissues in the soil although these usually provide some nutrients which become available as the process of decay proceeds. There is some evidence that the decaying tissues may mobilize phosphate and possibly potash for the use of other plants, and further that the free living bacteria which fix nitrogen from the air live on these products of decay. But these considerations are secondary to the effect of organic matter on soil structure, and consequently on water and oxygen availability.

Publications of the R R I

The two principal publications of the Rubber Research Institute of Malaya are its JOURNAL and its PLANTERS' BULLETIN. In addition there are REPORTS, usually annual, and a number of series of special publications which have appeared in the past.

This pamphlet lists all current literature now available, with revised prices. Order direct from the Rubber Research Institute of Malaya, P.O. Box 150, Kuala Lumpur, Malaya.

Subscribers may deposit $15 to receive all future publications. Statements of account are submitted annually. For PLANTERS' BULLETIN only, a deposit of $10 is requested.

There is also a mailing list for distribution of one copy gratis (of each of our publications prepared for general issue) to rubber estates over 100 acres, in Malaya and certain other countries which contribute on a national level to the work of the R.R.I. An application form is available on request. Additional copies are charged for.

In Europe, orders may be sent to the London Advisory Committee for Rubber Research (Ceylon & Malaya), Imperial Institute, London S.W.7. Payment in sterling is at 2s 4d per $1 Malayan.

April 1953

Journal

THE SCIENTIFIC RECORD OF WORK OF THE institute. Each issue is now a single 'Communication', in the usual form of an original scientific paper. Publication is irregular, a volume being completed when a convenient number of pages is reached. Price **$1 per issue.**

This publication commenced in 1929 as the *Quarterly Journal* of the R.R.I., changing to its present title, *Journal of the Rubber Research Institute of Malaya,* in 1931. A very limited stock of the early issues remains for disposal at *$3 a volume* (index to complete volume not always available), up to Volume 6 (1935). We will gladly refund cost and postage for issues out of stock: Volume 7 Nos. 1 and 2; Volume 8 No. 2; also the more recent Volume 10, Communications 245 and 250.

In 1939 the present mode of irregular publication was introduced, so that each individual Communication might appear as soon as it was ready. Except for Communications 245, 250, 260 and 261 all are at present available *$1 per issue.* Communications 236/237, 239/240, 241/242, 257/258 are combined numbers, priced as single issues.

A subject index to Volumes 1 to 12 (1928-50) is available, *price $1,* while subsequent issues are listed below:

Volume 13 (1951)

271 Studies in Hevea Rubbers, I and II
G.F. Bloomfield

272 Studise in Hevea Rubbers, III and IV
G.F. Bloomfield

273 Studies in Hevea Rubbers, V and VI
G.F. Bloomfield

274 A Provisional Classification of Malayan Soils
G. Owen

275 Progress of Breeding Investigations with Hevea Brasiliensis, II
C.C.T. Sharp

276 Latex Symposium

Volume 14 (1952-3)

277 Report on Technical Classification of Natural Rubber in Malalya

278 A Hitherto Undescribed Leaf Disease of Hevea Rubber Caused by a Species of Colletotrichum
K.P. John

279 Mooney Viscosity Changes in Freshly Prepared Raw Natural Rubber
R.I. Wood

280 Bird's Eye Spot Leaf Disease of the Hevea Rubber Tree Caused by Helminthosporium Heveae Petch
R.N. Hilton

281 Determination of Volatile Fatty Acids in Natural Rubber Latex
M.W. Philpott and K.C. Sekar

282 Determination of Available Nutrients in Malayan Soils
G. Owen

283 Studies on the Phosphate Problem in Malayan Soils
G. Owen

Many issues of the *Journal* are of specialised, rather than general, interest. For this reason some are not distributed fully on the estates (gratis) mailing list. Each Communication is commented upon from the planter's point of view in the *Planters' Bulletin*, to enable each reader to decide if it is necessary to him.

Also of specialised interest are three papers by J.P. Riches and E. G.B. Gooding, published in *The New Phytologist* (1952), and collected together for issue under the heading *Studies in the Physiology of Latex*. A few copies are available, at a charge of *25 cents* towards postage and costs of reissue.

Planters' Bulletin

A MEDIUM OF THE R.R.I'S SERVICE TO ESTATES. Articles are of direct practical use to planters. Publication is on the first of each alternate month, issues being successively numbered. The New Series Planters' Bulletin commenced with P.B. 1 in May 1952. Back issues are available, price **50 cents per issue.**

A stout cover, with gold lettering on the spine, will be available at about *$4* before the end of the year. Each copy of *Planters' Bulletin* may be readily inserted by the reader and kept neatly for reference. Watch the back inside cover of *Planters' Bulletin* for details in due course.

The original series of *The R.R.I. Planters' Bulletin* appeared over the period 1939 to 1941. A limited number of some of the 18 issues remains, but Nos. 1, 2, 5, 7, 13, 14 and 18 are out of stock. We should be grateful to receive any unwanted copies of these latter, for which a refund of cost and postage will gladly be made. Price *25 cents per issue*, old series.

Circulars

This series of numbered leaflets has been discontinued, now that the New Series of *Planters' Bulletin has* commenced. A few remain which are not obsolete, but it is intended to replace these by uptodate articles in *Planters' Bulletin*. The last of the series, which appeared during 1952, are listed:

34. *Note on clone L.C.B. 1320*
35. *Application of the R.R.I. bleaching process to the preparation of white latex crepe*
36. *Stump poisoning and root disease*
37. *Choice of clones and clonal seedlings: planting recommendations for 1952-3*

Circulars are issued *free* on request, as long as the stock lasts.

Distinct from these printed circulars, each Division of the R.R.I. prepares their own Memoranda and Advisory Leaflets, duplicated from typescript. These are not publications and there is no general issue of them. They are used in amplification of advisory correspondence, and are intended only to be read in such individual contexts. When such material matures to general interest, it is printed in *Planters' Bulletin*.

Reports

Annual Reports of the work of the Divisions during the year, with general reports by the Director and reports of the Board, are available for each year from 1928 (including initial period, from September 1926) to 1940, except for the years 1934 and 1936, at *$1 each.* We will gladly refund cost and postage on return of either of the two issues out of stock. An *Abridged Annual Report 1940* is also available *at 20 cents per copy.*

After 1940 two *Reports* cover the next eight years which included the periods of Japanese occupation of Malaya and subsequent reorganisation. Each is available at *$1 per copy*:

Report for the period January 1941 to August 1945

Report for the period September 1945 to December 1948

The years 1949-53 are the period of the Five Years Plan of the Malayan Rubber Fund, and *Reports* for the years 1949-51 are drafted in a way that together they constitute an interim report on progress of the research programme framed in the Five Years Plan. This series is now in course of publication: to date the following sections are available:

Pathological Division 1949-51 (*$2*)

Chemical Division 1951 (*50 cents*)

Smallholders Advisory Service 1949-51 (*$2*)

In addition, the *Annual Report for 1951 of the Smallholders' Advisory Service of the Rubber Research Institute of Malaya* is also available separately at *50 cents per copy.*

Reports of the Divisions for 1952 are being drafted in a new, shorter form, and it is intended to resume publication of *Annual Reports* commencing with the year 1952.

Planting Manuals

Of this series of ten instructional manuals for use on estates or smallholdings (see end of leaflet regarding special publications for smallholders) five remain available. The rest are obsolete and have been, or are being, replaced by uptodate material. Price *$2 per copy.*

Plantation Sheet Rubber Manufacture (No. 3)
1932 : obsolescent

Latex Preservation, Concentration and Shipment (No. 4)
2nd edition 1947

The Uses and Control of Natural Undergrowth on Rubber Estates (No. 6)
2nd edition 1940

R.R.I. – Type Smoke-houses (No. 9)
1949

Socfin Method for 'Naked' Baling of Rubber (No. 10)
1951. Available in Malaya only

Bulletins

This series of special bulletins was published some 20 years ago. A limited stock of the following remains for disposal, at *$1 per copy*:

A study of the effect of damp storage on raw rubber

The root disease problem on old rubber areas in Malaya

Summary of meteorological records, Soils Division

Variations in the composition of latex from clone and seedlings rubber

This series should not be confused with *Planters' Bulletin,* which is described at the beginning of this leaflet.

Information Cards

A set of cards, revised in 1948, prepared by Chemical Division for ready reference in the estate factory, price *$1 per set*. The main headings are: useful general information, standardising and coagulation of latex, estate chemicals and their uses, defects in rubber, manufacture of pale crepe, preservation and testing of latex.

P.T.O.

Smallholders

MUCH OF THE MATERIAL ALREADY LISTED IS OF interest of smallholders, but in addition there is literature designed to meet their special requirements. This includes texts in Jawi (J), Chinese (C) and Tamil (T), as well as English (E).

Current SHAS booklets available are:

Control of Root Disease in Young Rubber
SHAS No. 3 : E,J,C,T

Centralised Processing of Smallholders Latex
SHAS No. 4 : J. English version appears as Communication 268 of the *Journal*

Budgrafting
SHAS No. 5 : J/C, E/T, illustrated

Various circulars are available from the Smallholders' Advisory Service of the R.R.I., to meet special requests for information.

A 16 mm sound film *Getah*, prepared by the Malayan Film Unit for the R.R.I., is available on application to State Information Officers. There are six parts, dealing with the subjects listed below, and suitable for separate exhibition. Each shows for about a quarter hour, with a commentary in Malay.

I : Good tapping : mouldy rot control

II : Preparation of good sheet rubber on smallholdings

III : Preparation of planting material

IV : Budgrafting

V : Replanting

VI : Centralised processing of smallholders' latex

Printed for the Board of the Rubber Research Institute of Malaya by
The Standard Engravers & Art Printers, 51 Campbell Road, Kuala Lumpur
Selangor

Plant roots, like most living things, need free oygen to live. In a few plants, notably padi, oxygen comes down to the roots through holes in the stem of the plant. The rest require oxygen very close to all portions of the root surfaces, as the gas cannot diffuse any distance along the inside of the root.

Oxygen deficiency can always be traced to soil compaction and waterlogging; improvement of soil structure should allow water to flow away horizontally or vertically, and air to enter. It has been suggested that 10% of the soil volume should be air (*i.e.* 2% oxygen) for the best results with a variety of crops in the West Indies.

A soil that contains a higher percentage of air is likely to be too free draining, and even in the wet climate of Malaya, rubber trees on soils like these would probably suffer from general lack of water. For these sandy types the addition of organic matter would probably improve the water conditions in the soil. The partly decomposed organic matter collects in pockets between the sand grains, and binds them together to give an aggregate with many minute holes inside it which retains water more effectively than the sand alone.

The part of the organic matter that is most active is called humus, being a complicated mixture of gums, akin to starch in nature. Synthetic soil conditioners, such as Krilium, are water soluble resins designed to imitate the action of humus. They have the advantage that they are more powerful aggregating agents, weight for weight, and less easily destroyed by bacteria and fungi than humus, which has to be continuously renewed from decomposing plant tissues.

Krilium was evolved at the beginning of 1952 by the research staff of Monsanto Chemicals. It is still in the experimental stage, except possibly in the United States, and is not on sale in Malaya.

The latest formulation is the sodium salt of a vinyl acetate maleic acid copolymer. Although water soluble it does not wash out of the soil as it is strongly adsorbed onto the surfaces of clay particles, becoming 'fixed' in much the same way as does phosphate. It is still of value to the tree when fixed because of the improved soil structure, whereas phosphate availability is decreased by fixation. The Krilium molecule is in the shape of a long chain. One such chain can bridge the gap between two adjacent small mineral particles. The effect of many chains is to build a porous mass, because the volume of the Krilium molecules is not sufficient to fill the holes.

The conditioner is spread over the surface of dry soil, mixed in by hand or with a rotary hoe and fixed by wetting the soil. The crumbs produced are the stabilized form of an otherwise very temporary soil fluffiness obtained by cultivation methods. Krilium has the same beneficial effect on soil structure as has decomposing plant matter, due to the improved water and oxygen status of the soil and resistance to puddling when cultivated wet.

The manufacturers of Krilium suggest the following application for nurseries and greenhouses: one to one and a half pounds of Krilium for every 10 ft x 10 ft square is spread on the dry surface and mixed in to a depth of one and a half inches with a rotary hoe. On this basis an application in the planting hole of two ounces of Krilium mixed with the dry earth that is to lie in the top half of the hole might be of value in helping a stump to get away.

Krilium is at present expensive, being over $3 (Malayan) per pound, and the cost of the conditioner when used as above in a nursery would be at least $550 to $850 per acre. At 200 holes per acre the cost of treating planting holes would be over $75 per acre. Applications to the top three or four inches of an acre of ground would cost about $1,500 per acre.

Although no work has yet been done in Malaya to determine the value of Krilium in rubber cultivation, experimental work has been planned to commence this year using some of the small quantity (20 lb) of Krilium sent by the manufacturers for preliminary testing.

It is expected that Krilium is only likely to have good effect on soil structure where aeration is the limiting factor on growth. Only estates on coastal clay soils are expected to derive benefit from its use and then only the fields where drainage is particularly bad. Whether the improvement of growth of rubber trees by Krilium would be economic is open to question. Krilium is reported to remain effective in the soil for three years under the climatic conditions of the lower Mississippi valley, but may last a much shorter time under Malayan conditions. Repeated applications would make the treatment very expensive.

SOILS DIVISION

Replanting and Malaria

IN THE YEARS JUST BEFORE THE LAST WAR malaria in this country had risen in one of its periodical waves. The high incidence of malaria on many rubber estates was causing concern, and it was clear that replanting was one of the factors which had contributed to this increase. The Malaria Advisory Board repeatedly drew attention to this danger from replanting, and one of its warnings was published in *Planters' Bulletin* (Old Series) in February 1940.

Recently, in view of the current replanting campaign and the malaria season (May to June), the Board was invited to renew its warning. Fortunately the danger of replanting as a cause of malaria seems less than it used to be. But it is important to realise why this should be so, in order to avoid doing unwittingly something which will cause a return to the former conditions which gave rise to so much malaria.

Before the war the methods commonly used in replanting were liable to cause a great increase in the numbers of the chief malaria carrying mosquito, *Anopheles maculatus*. Felling and uprooting the old rubber trees let in the sunlight and left holes which filled with water. This, combined with the digging of silt pits and planting holes, and the blockage of streams by felled trees. caused a multiplication of suitable breeding places for the larvae of the mosquito, which thrive particularly under conditions of sunlight and soil disturbance.

Present replanting methods avoid many of these dangers. Poisoning the old trees so that they decay slowly where they stand, while the young trees grow in between, causes a gradual instead of an abrupt change of conditions, and there is the minimum of soil disturbance and interference with drainage. The result is that there need not be any great

increase in the number of breeding places for the mosquito. It all depends upon the exact methods employed. If old stumps are rooted out and planting holes left open for some time, increased mosquito breeding may result. Where most of the conditions caused by the old replanting methods are recreated today, as perhaps in felling and planting of new land, or in replanting by smallholders, the dangers of increased mosquito breeding and increased malaria are as great as before. However, efficient drugs are now available for the suppression of malaria should an outbreak occur.

It is urged that visiting medical practitioners should always be kept fully informed of replanting programmes so that they can decide what precautions to take in the light of the particular circumstances. Where replanting areas are distant from the lines and do not seem likely to cause any great increase in dangerous mosquito breeding, no special precautions may be needed beyond a close watch on the number of cases of malaria among the labourers. Where replanting is carried out close to the lines, and increased mosquito breeding is feared, it may be necessary to undertake mosquito larval control, or to extend and intensify what is already being done. DDT or Gammexane spraying of the lines, and a tightening up of Paludrine or other drug prophylaxis may also be advisable.

Finally, we should beware of complacency. Although malaria has not been a serious problem since the war, it would be foolhardy to assume that this is a permanent state of affairs. The widespread use of drugs such as Paludrine may have contributed much to the low incidence of malaria, and present replanting methods may have helped, but it is unlikely that this is the whole story. Malaria may yet surprise us by another of its periodical outbursts, and then replanting, even by present methods, may easily be fuel to the fire.

MALARIA ADVISORY BOARD

Phosphate Problem in Malayan Soils

Rubber trees have been found to respond, during their early years of growth after planting, to phosphate manuring on most types of inland soils in Malaya. Phosphates when added to Malayan soils suffer an appreciable degree of immobilisation which is generally considered to be due to conversion to relatively insoluble forms which are unavailable to plants. The mechanism of the reactions in the soil which lead to phosphate fixation have been widely studied in many parts of the world. A number of factors are involved in the reactions and no simple, single explanation of the phenomenon is applicable to all soils.

In Communication 282 (in press) of the R.R.I. Journal, Mr G. Owen discusses laboratory tests which have been made in studying the nature and distribution of the various forms of phosphate in Malayan soils, before and after treatment with phosphatic fertilisers. One of the interesting facts which is demonstrated is the occurrence of relatively high amounts of organic forms of phosphate, and it is concluded that a study of this form of phosphate in the soil may be of appreciable value in increasing the efficiency of phosphate manuring of Malayan soils.

17 March 1953

CHARLES CECIL TRISTAN SHARP Esquire was born in October 1896. He was educated at Malvern College, enlisted in the Middlesex Regiment in 1914 and was later commissioned in the Grenadier Guards. He was severely wounded in France in 1916, suffering injuries that impaired his health, but never his courage, for the rest of his life. On leaving the Army and after a period of study in the Royal College of Science in London, he was appointed to the Agricultural Department of the Kenya Colony in 1921, resigning his appointment in 1929. After further study at Cambridge, Mr Sharp was appointed Botanist on the Staff of the Rubber Research Institute of Malaya, Kuala Lumpur, in 1931. He became Head of the Botanical Division in 1946 and was appointed Deputy Director of the Institute in 1950 and has on several occasions acted as Director and Chairman of the Board.

During the time of the Japanese invasion of Malaya Mr Sharp was evacuated from Singapore and, surviving the bombing and sinking of the s s 'Kuala', made his way through Sumatra and eventually to Ceylon. In Ceylon he continued to work on rubber at the Ceylon Rubber Research Institute, returning to Malaya in December 1945. He did splendid work in the early reorganisation of the work of the Institute after the Japanese occupation until he was joined in 1946 by other members of the staff who returned from recuperation leave. His work for the rubber industry has been principally in the field of breeding and selection of high yielding planting material and in this field he was well known to planters throughout Malaya and the Far East.

Despite periods of illhealth he has remained devoted to the work of the Institute and the industry it serves. By his death the Institute has suffered a grievous loss. His colleagues mourn a staunch friend. They tender deepest sympathy in their bereavement to his wife Alison and to his children Briony and Richard.

Some Planting Manuals

LATEX PRESERVATION, CONCENTRATION AND SHIPMENT

A practical review of latex preservation and shipment as a commercial process, to assist producers contemplating entering the field. A survey of patents on latex preservation and concentration is included. Planting Manual No. 4. *By J.H. Pidford. second edition, 1947, $2.*

THE USES AND CONTROL OF NATURAL UNDERGROWTH ON RUBBER ESTATES

A consideration of the best methods for the establishment, maintenance and control of indigenous cover plants, copiously illustrated. An appendix classifies cover plants practically and contains about 80 full page drawings. Planting Manual No. 6. *Second edition being a revision of the original by W.B. Haines, 1940, $2.*

R.R.I. TYPE SMOKE HOUSES

The R.R.I's recommendations on the construction and operation of tunnel type smoke houses, based on a long series of experiments. With plans and bills of quantities. Planting Manual No. 9. *1949, $2.*

SOCFIN METHOD FOR "NAKED" BALING OF RUBBER

Full information, with illustrations and working drawings, of a method of baling sheet rubber which has been very well received by consumers overseas. Planting Manual No. 10 *By Socfin Company, 1951, $2 (only available in Malaya).*

These books are available from the R.R.I., P.O. Box 150, Kuala Lumpur. Planting Manuals Nos. 1, 2, and 7 are obsolete and out of stock, but we shall be pleased to pay $2 each on receipt of any unwanted copies of these publications in good condition.

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Printed for the Board of the Rubber Research Institute of Malaya by
The Standard Engravers & Art Printers, 51 Campbell Road, Kuala Lumpur
Selangor